Amendments to Specification

Page 15, line 5 through line 20:

As mentioned above, the preferred percentages of pores filled with reactant gas and water is dependent upon the size of the pores within the substrate layer and the pressure differential between the reactant gas streams 22, 24 and the coolant stream. The percentage of pores containing liquid or reactant gas will be controlled by the respective coolant stream 26 and reactant gas 22, 24 streams, wherein the reactant gas streams 22, 24 will typically have a greater pressure than the coolant gas stream 26. Specifically, because the pressure of the reactant gas streams 22, 24 are typically equal to about ambient pressure, the pressure of the coolant stream 26 is less than ambient pressure. Moreover, the pressure differential between the coolant stream 26 and the reactant gas streams 22, 24 will preferably be in the range of ~~more than zero psi but less than two~~ 0.2 psi - 1.7 psi.

Page 33, line 20 through page 35, line 6:

Fig. 11 illustrates the importance of creating a pressure differential between the reactant gas streams and the coolant stream, such that the pressure of the reactant gas streams is greater than the pressure of the coolant stream. Specifically, Fig. 11 illustrates the performance of a fuel cell having a configuration designated by the symbol ▲, which was discussed in reference to Table 1. Using the same test conditions discussed hereinbefore in reference to this fuel cell and holding all such test conditions constant, with the exception of the pressure differential between the coolant and the oxidant gas stream, the fuel cell voltage was plotted as a function of pressure differential. The pressure differential between the coolant and the oxidant gas stream varied from approximately zero to 4.4 psi. Specifically, as indicated by the arrows in Fig. 11, the test began by creating a pressure differential of about 4.4 psi, which was gradually reduced to zero and thereafter gradually increased to its original pressure. As the fuel cell operated at a pressure differential equal about zero to a range of about 1.0 to 2.0 psi, the cell voltage increased from about 0.38 volts to 0.58 volts, respectively. However, as the fuel cell operated at a

pressure differential in excess of about 1.0 to 2.0 psi the cell voltage remained relatively constant at a voltage of about 0.58 to 0.60 volts. The data in Fig. 11 illustrates that the performance of the fuel cell designated by the symbol ▲ improved significantly as the pressure differential between the coolant stream and the oxidant gas stream increased from zero to the range of about 1.0 to 2.0 psi, after which point the performance of the fuel cell remained relatively unchanged. Performance is improved as the pressure differential between the coolant stream and oxidant gas increases because the water occupying the hydrophobic cathode substrate layer is displaced and enters the water transport plate adjacent the cathode support plate. Likewise, operating a fuel cell with a pressure differential between the coolant stream and the fuel reactant gas stream more accurately controls the amount of water that enters the hydrophilic anode substrate layer. A range ~~of more than zero~~ between 0.2 psi ~~but less than two~~ and 1.7 psi is preferred. This aspect of the invention can be beneficial in fuel cells having no diffusion layer. Moreover, unlike the operation of the fuel cell described in U.S. Patent No. 5,641,586, operating a fuel cell, having hydrophilic substrate layers, with a pressure differential between the coolant stream and the reactant gas streams, increases the percentage of pores within the hydrophilic substrate layers that contain reactant gas and decreases the percentage of pores that contain coolant. The increased number of pores containing reactant gas within the hydrophilic substrate layers, in turn, facilitates the diffusion of the reactant gases from the passageways in the water transport plates to the catalyst layers within the MEA.